

CLAIMS

1. Process for producing a low volatility metal flake pigment composition,
5 which comprises milling metal powder in a non-aqueous, non-hydrocarbon, low volatility milling fluid.
2. Process according to claim 1, which further comprises the addition of one or more substances that act as a lubricant and/or corrosion inhibitor.
- 10 3. Process according to claim 1 or claim 2, which further comprises the step of removing oversize or undersize particles after milling.
4. Process according to any of the preceding claims, which further
15 comprises concentrating after milling to a metal flake pigment paste of 50-90% metal by weight.
5. Process according to claim 4, wherein the paste is converted to a granule form by incorporating an organic binder to form a coherent paste of
20 organic binder, milling fluid and metal flake pigment.
6. Process according to claim 5, wherein the paste of organic binder, milling fluid and metal flake pigment is in a particulate form such that at least 98%
25 by weight of the particles are retained on a sieve having a 150 μ m aperture.
7. Process according to claim 5 or claim 6, wherein the granules have a length of 5 to 20mm and a thickness of 1.5 to 3mm.
8. Process according to any one of claims 5 to 7 wherein part or all of
30 the milling fluid is removed at elevated temperature.

9. Process according to any of the preceding claims, which further comprises a step of treating the milled metal flakes in the milling fluid.
10. Process according to claim 9, wherein the metal flakes are treated with
5 a phosphate, silica or alumina, ammonium dichromate or ammonium or potassium permanganate.
11. Process according to any of the preceding claims, wherein the metal flakes are thermally treated after the milling step.
- 10 12. Process according to any of the preceding claims, wherein the milling fluid is pentyl alcohol, hexyl alcohol, 2(2-n-butoxy ethoxy ethanol), tetrahydropyran, tetrahydropyran-2-methanol, ethylene glycol, dimethylene glycol, diethylene glycol, trimethylene glycol, triethylene glycol, propylene glycols,
15 butylene glycols, glycerol, gamma butyrolactone, 2-pyrrolidone, N-methyl pyrrolidone, isophorone, triacetin, 2,5-hexanedione, tetraethylene pentamine, triethyl phosphate, ethyl acetoacetate, n-methyl formamide, propylene carbonate, ethylene glycol monobutyl ether, diethylene glycol monomethyl, monoethyl, monopropyl and monobutyl ethers, triethylene glycol monomethyl, monoethyl,
20 monopropyl and monobutyl ethers, diethylene glycol dimethyl, diethyl, dipropyl and dibutyl ethers, triethylene glycol dimethyl, diethyl, dipropyl and dibutyl ethers, propylene glycol monobutyl ether, dipropylene glycol monomethyl, monoethyl, monopropyl and monobutyl ethers, tripropylene glycol monomethyl, monoethyl, monopropyl and monobutyl ethers, dipropylene glycol dimethyl, diethyl, dipropyl
25 and dibutyl ethers, tripropylene glycol dimethyl, diethyl, dipropyl and dibutyl ethers, diamyl ether, methoxypropyl acetate, ethylene glycol monobutyl ether acetate, diethylene glycol monomethyl ether acetate, diethylene glycol monoethyl ether acetate, diethylene glycol monobutyl ether acetate, dipropylene glycol monomethyl ether acetate, propylene glycol diacetate, methyl, ethyl and propyl
30 lactate or the monomethyl, monoethyl, dimethyl and diethyl esters of succinic, glutaric and adipic acids, or a mixture of any two or more of these.

13. Process according to claim 12, wherein the milling fluid is propylene carbonate, tripropylene glycol monomethyl ether, dipropylene glycol dimethyl ether, dipropylene glycol n-propyl ether, diethylene glycol monomethyl ether acetate, diethylene glycol monobutyl ether acetate, or mixtures of dimethyl esters of adipic, glutaric and succinic acids.
14. Process according to any of the preceding claims, wherein the metal is aluminium, zinc, copper, tin, nickel, silver, gold, iron, or an alloy thereof.
15. Process according to claim 14, wherein the metal is aluminium or gold bronze.
16. Process according to any of the preceding claims, wherein the metal pigment particles have a median diameter of 6 μ m to 600 μ m.
17. Process according to claim 16, wherein the metal pigment particles have a median diameter of 10 μ m to 300 μ m.
18. Process according to any of claims 2 to 17, wherein the corrosion inhibitor is calcium phosphate, magnesium phosphate, calcium phosphosilicate, calcium strontium phosphosilicate, aluminium zirconium zinc phosphosilicate, calcium strontium zinc phosphosilicate, alkyl and dialkyl phosphates, phosphites and their derivatives, phosphonic acid derivatives, phosphate esters of long chain ethoxylated alcohols, organic silanes and silicates, compounds of molybdenum, vanadium, titanium, zirconium, and tungsten and heteropolyanionic compounds thereof, ammonium dichromate or chromic acid.
19. Process according to any of claims 2 to 18, wherein the lubricant is a long chain or polymeric fatty acid, a phosphate ester of a long chain ethoxylated alcohol, lauryl phosphonic acid, lauryl phosphate or a mineral oil.

20. Process according to any of the preceding claims, comprising ball milling the metal powder.
- 5 21. Use of a non-aqueous, non-hydrocarbon milling fluid in a process of milling a metal powder as claimed in any of the preceding claims.
22. A metal pigment paste obtainable by the process of any of claims 1 to 20.
- 10 23. A granule obtainable by the process of any of claims 5 to 20.
24. A granule produced by the process of any of claims 5 to 20.
- 15 25. An ink or surface coating comprising the metal pigment paste or granules produced by a process according to any of claims 1 to 20 and surface coating binders dissolved or dispersed in water, solvent or mixtures of the two.
26. Article obtainable by shaping a composition comprising granules produced by the process of any of claims 5 to 20.
- 20 27. Article obtainable by injection moulding or by extrusion of a thermoplastic, comprising granules produced by the process of any of claims 5 to 20.
- 25 28. Shaped article comprising a thermoplastic or thermosetting polymer and granules produced by the process of any of claims 5 to 20.